

THE INSTITUTE FOR

SOCIAL SCIENCE RESEARCH

for the New American University

GIS Services

Arizona Imagery Server

Building a High Performance, Scalable Imagery Server on a Virtualization Platform

Presenters

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Overview

Part 1: Overview of System Architecture

Part 2: Image Server

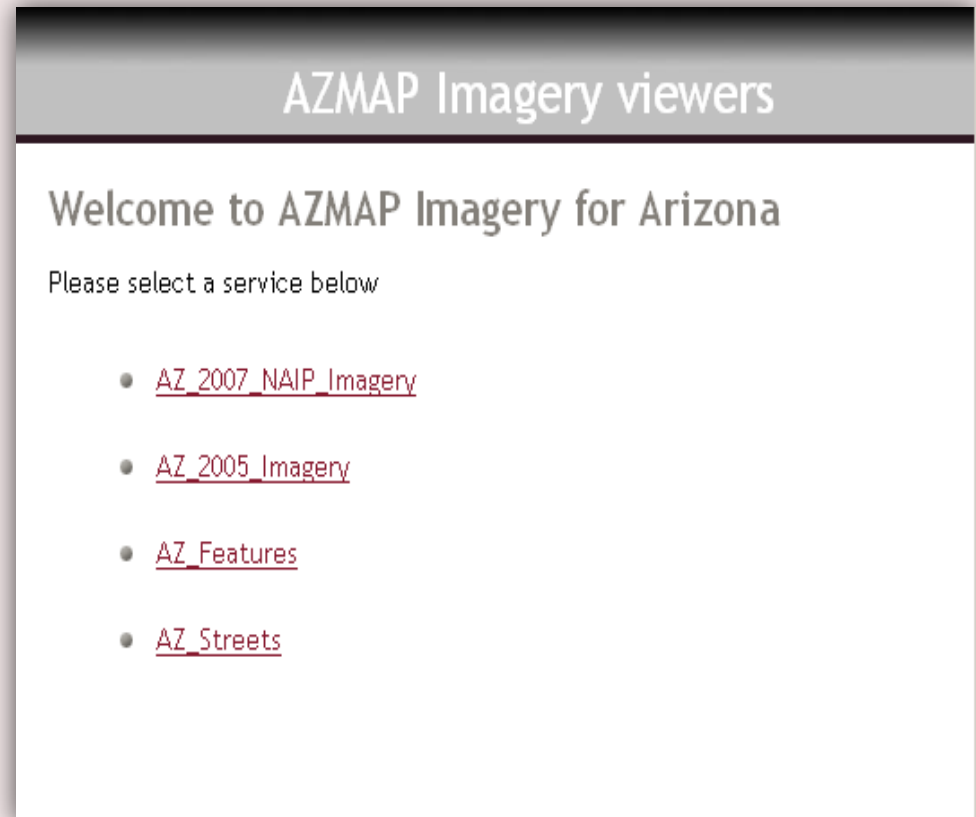
Part 3: ArcGIS Server

Part 4: AZ Imagery Web Services

Arizona Imagery Project Overview

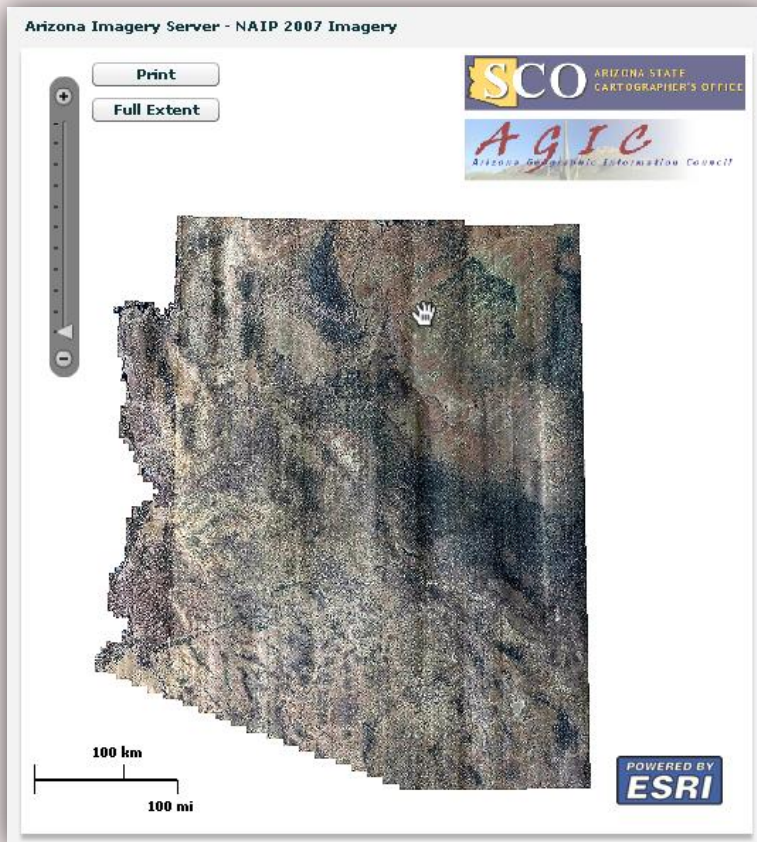
The **Arizona Imagery Server Project** is a multi-agency collaboration whose goal is to provide high quality imagery data for public access

One critical aspect of the project is to **provide the data in a number of formats including both proprietary as well as open source**



To view in a web browser - <http://imagery.azmap.org>

Arizona Imagery Project Overview



Web Services for the *Arizona Imagery Server Project* had to meet a wide range of requirements imposed by the funding agencies:

- Viewable by wide range of ESRI GIS Clients
- Viewable using Open Source protocols such as WMS
- Data Exposed in Web Service Format
- Broad cross-application compatibility

Overview of Previous System Architecture

- ✓ Hardware – Three physical Servers
- ✓ Software – ESRI SDE and ArcIMS
- ✓ Raster and Vector layers were stored in SDE.
- ✓ Web Services were served out using ArcIMS

Database Server

- SDE
- SQL Server 2000

File Server

- Storage space for Database

Application Server

- IIS Web Server
- ArcIMS

Challenges with previous Architecture

Hardware Issues

- Increasing cost of Service Contracts
- Failures increase towards end of lifecycle
- Overhead of running hardware based backups

Software Issues

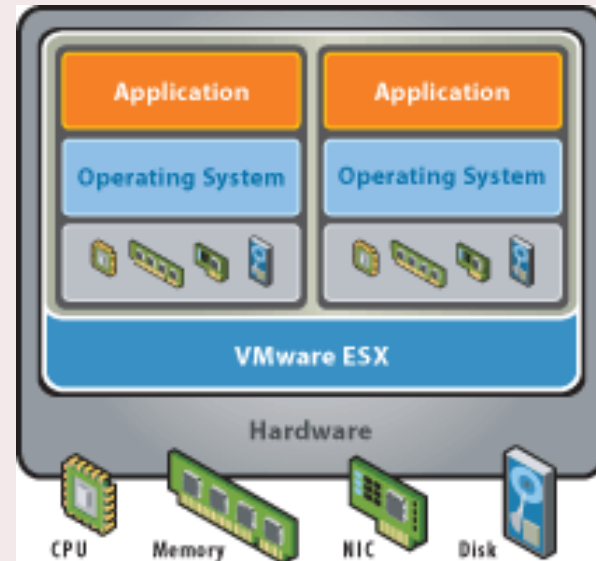
- SDE & SQL Server Administration overhead
- ArcIMS Performance
- No Caching component in ArcIMS

Expansion Issues

- Each dataset is several terabytes in size
- Storage appliance eventually runs out of space
- Solution – add additional drives or additional storage appliance
- Not easily maintainable

Current System Architecture

- Virtualization is key.
- Consolidate/ Virtualize Servers and Storage in order to reduce operating costs
- System has to expand easily as new datasets come in
- Use the ArcGIS Server system to increase performance
- Reduce maintenance overhead associated with SDE & Sql Server
- Use Image Server to serve out raster Data



Current System Architecture

- Virtualized dual server system with 8+ Tb of tiered storage (network)
- **VMware ESX** virtualization platform
- Raster Data processed and served using **Image Server**
- **SDE + SQL server no longer a requirement**
- **ArcGIS Server** used to serve both cached and dynamic web services
- **Tiered Storage solves expansion issues**
- Can easily add network storage via virtualization platform/vendor

Data Server

- Image Server
- Raw Imagery (file based)

Application Server

- IIS Web Server
- ArcGIS Server
- Tile Cache

ArcGIS Image Server

- Two modes possible for ArcGIS Image Server
- **Standalone Image Server**
- **Image Server extension for ArcGIS Server**
- **Definition Files** created using **Image Service Definition Editor** toolbar in **Arc Map**
- Definition files then compiled to Iscdef files.
- **Derived images** created to optimize the image service
- Check new service for quality, correct errors as required

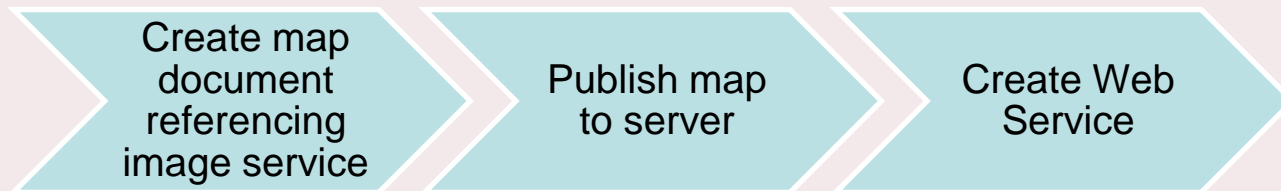
Image Server Service Creation Workflow



ArcGIS Server

- ArcGIS Server 9.3 was used as a replacement for ArcIMS
- **Imagery** was tiled and cached using **cache creation tools**
- Vector layers are exposed via **dynamic services**.

ArcGIS Server Service Creation Workflow



ArcGIS Server

- NAIP Imagery was cached upto 1:4000 scale for all of Arizona
- Total Cache size about 500 Gb
- AZ was broken up into a grid footprint.
- Each Grid was assigned a job number and further broken into regions (features).
- Each “job” shapefile was then used as an input to the cache creation tool.
- After a predetermined number of jobs had completed, a query was run to retrieve failed features which were then re-cached.
- QA/QC work was done after cache creation was completed.

ArcGIS Server Cache Creation For Large Caches

Create Job feature class

- Create a Grid for the entire area you wish to cache
- Each cell within this grid is a “job” feature class
- Each feature within the “job” feature class is a “region”
- Track completion for each “region” feature using a field called “CACHE”

Run Cache Creation Tool

- Run the Cache creation tool, based on feature class created above
- Track completion status for each feature
- The service instance will restart itself after every feature (overhead)
- Feature geometry should not be complex

Query Completion Status

- After “n” number of jobs have completed
- Query completion status field for “job” feature classes
- Isolate failed features, re-cache
- QA/QC can be performed in parallel while other regions of the map are being cached

ArcGIS Server Caching and Virtualization

- Caching is heavily dependent on cpu speed and file IO
- If using Network storage, may face latency issues
- Generally caching on a VM is slower as compared to a physical server
- The faster your network storage, the faster your cache will complete
- For processor usage Vmware ESX will be handling your threading.
- Generally this is also reliant on the Virtualization environment and the allocation of resources available to your VM
- If possible cache on a physical server and then copy over cache to the VM
- Windows Hyper V is another alternative to Vmware.

AZ Imagery Services

- Imagery is available to the public in a wide variety of formats
- ESRI Clients and Application environments supported
 - Arcmap
 - ArcGIS Explorer
 - ArcGIS Web ADF
 - ArcGIS FLEX Api
 - ArcGIS JS Api
 - ArcGIS Silverlight Api
- Open Source Clients
- **Any WMS compatible open source client or application (OpenLayers Api)**

AZ Imagery Web Services

- **HTTP://IMAGERY.AZMAP.ORG**
- Arcmap Connection String – <http://imagery.azmap.org/arcgis/services>
- WMS Connection –
http://imagery.azmap.org/ArcGIS/services/AZ_2007_Imagery/MapServer/WMSServer
- For use in a REST Based application (Service Directory) -
<http://imagery.azmap.org/ArcGIS/rest/services>

Please visit <http://sco.az.gov/imagery.htm> for complete instructions + connection strings

List of available web services

- AZ_2007_Imagery – Cache Map Service for 2007 Imagery (NAD83 UTM)
- AZ_2005_Imagery – Map Service for 2005 Imagery
- AZ_Features – Map Service for vector layers (towns, cities, etc)
- AZ_Streets – Cache Map Service for AZ Street Network
- NAIP_WGS84 – Map Service for 2007 Imagery in WGS84 (for use with ArcGIS Online data)

Demo + Questions & Answers

[HTTP://IMAGERY.AZMAP.ORG](http://IMAGERY.AZMAP.ORG)

Please let us know if you have any comments

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